



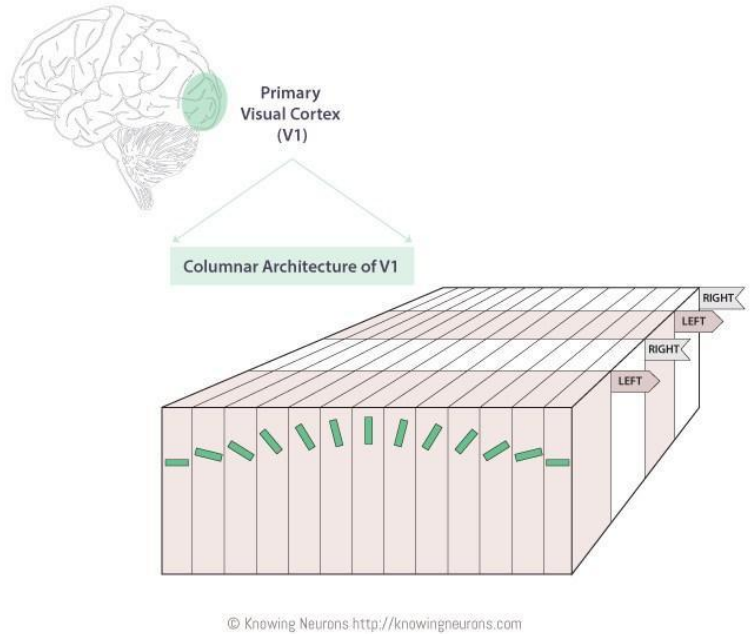
Deep Reinforcement Learning



with Retro Video Games



Brief History of Neural Networks



1950s <- We started to learn how the vision system interacted with the brain

1980s -> Started to build computer representations of the vision system

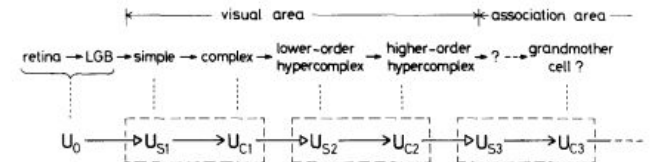


Fig. 1. Correspondence between the hierarchy model by Hubel and Wiesel, and the neural network

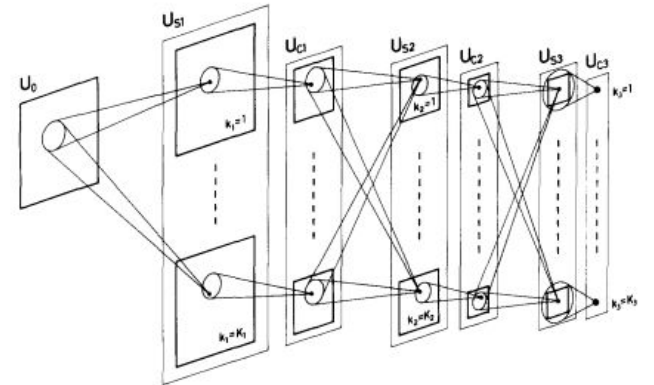


Fig.
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Then Back-Propagation was Introduced

Learning representations by back-propagating errors

David E. Rumelhart*, Geoffrey E. Hinton†
& Ronald J. Williams*

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1986 -> A unique way to optimize
weights on parameters was
introduced and we are first
introduced to Geoff Hinton

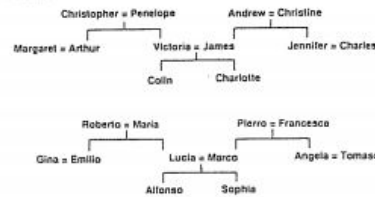
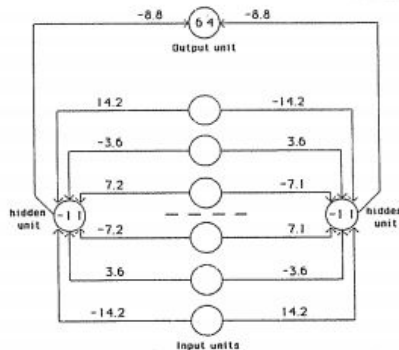
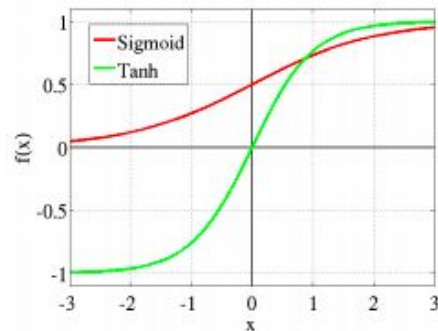
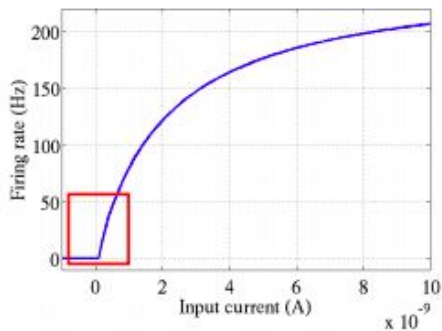
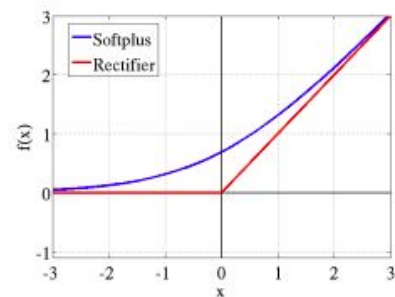
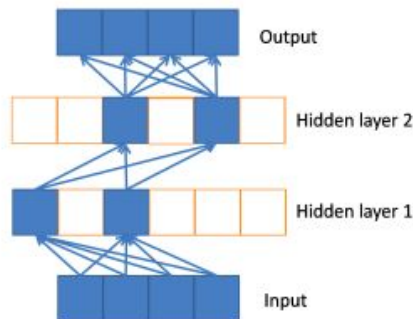


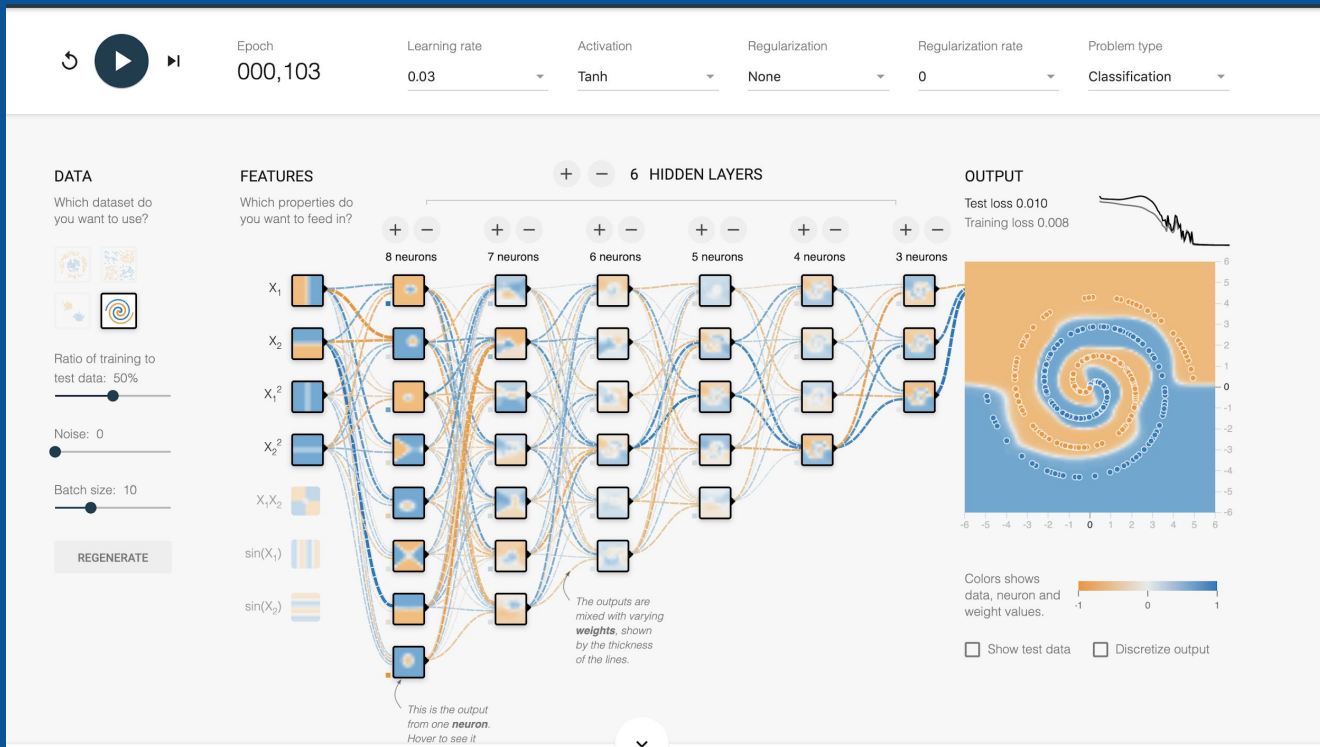
Fig. 2 Two isomorphic family trees. The information can be expressed as a set of triples of the form (person 1)(relationship)(person 2), where the possible relationships are {father, mother, husband, wife, son, daughter, uncle, aunt, brother, sister, nephew, niece}. A layered net can be said to 'know' these triples if it can produce the third term of each triple when given the first two. The first two terms are encoded by activating two of the input units, and the network must then complete the proposition by activating the output unit that represents the third term.

Activation Functions

2011 -> ReLU activation function
reduces training time
(Glorot, Bordes, & Bengio)



Parameters & Why Deep Learning



Different Types of Machine Learning

1) Supervised Machine Learning

- **The system has a teacher** | in the form of labelled data

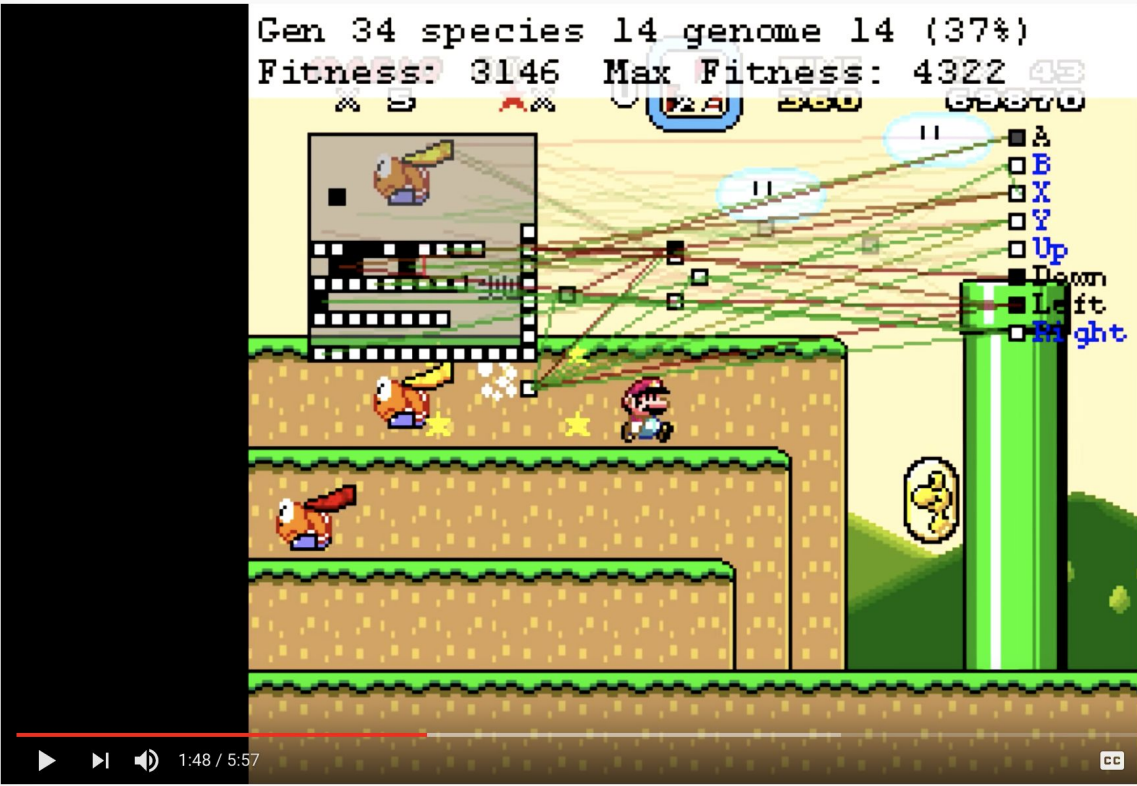
2) Unsupervised Machine Learning

- **The system has NO teacher** | but learns through grouping like items together

3) Reinforcement Machine Learning

- **The CLASSROOM is the teacher** | through positive/negative rewards of student's actions

MarI/O (2015)



Gen 34 species 14 genome 14 (37%)
Fitness: 3146 Max Fitness: 4322 43

■ A
□ B
□ X
□ Y
□ Up
■ Down
■ Left
□ Right

1:48 / 5:57

MarI/O - Machine Learning for Video Games

8,991,591 views • Published on Jun 13, 2015

150K 2.9K SHARE SAVE

The image is a screenshot of a YouTube video titled "MarI/O - Machine Learning for Video Games". The video content shows a Super Mario Bros. level with a neural network overlay. The neural network consists of a grid of nodes (squares) connected by lines, representing the game's state and actions. The nodes are labeled with letters (A, B, X, Y) and directions (Up, Down, Left, Right). The video player interface shows the video is 5:57 long, and the current time is 1:48. The video has 8,991,591 views and was published on Jun 13, 2015. The video player also shows a like button with 150K likes, a comment button with 2.9K comments, and buttons for sharing, saving, and more options.





AlphaStar: Mastering the Real-Time Strategy Game StarCraft II

Games have been used for decades as an important way to test and evaluate the performance of artificial intelligence systems. As capabilities have increased, the research community has sought games with increasing complexity that capture different elements of intelligence required to solve scientific and real-world problems. In recent years, StarCraft, considered to be one of the most challenging Real-Time Strategy (RTS) games and one of the longest-played esports of all time, has emerged by consensus as a “grand challenge” for AI research.



Download 11
replays



OpenAI beats OG

OpenAI's Dota 2 AI steamrolls world champion e-sports team with back-to-back victories

The International 2018 champion OG loses to OpenAI's bots in a stunning defeat

By Nick Statt | @nickstatt | Apr 13, 2019, 5:05pm EDT

f t SHARE

 **Greg Brockman**  @gdb · Apr 13, 2019
Replying to @gdb
Bots do something humans don't do: gyro is killed and immediately buys back even though the base isn't under attack.

 **Greg Brockman**  @gdb
We see this happen in test games all the time: the bots buy back, the humans laugh, and then the humans lose. Hard to know if it'll happen here too...

♡ 15 12:35 PM - Apr 13, 2019

 See Greg Brockman's other Tweets



GitHub Repo

<https://github.com/ChrisHuie/ASUTalkDeepLearningWithGames>